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Environmental Information Disclosure of Listed Company Study on the Cost of Debt Capital Empirical Data: Based on Thermal Power Industry

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Abstract

Environmental pollution incidents in recent years, at the cost of sacrificing the environment's mode of economic development are facing a deep review. This 2008 year to 2012 year in Shanghai and Shenzhen-listed power companies for the study, from the point of view of debt financing effect of environmental information disclosure on corporate debt, the cost of capital. Study: Environmental information disclosure levels significantly impact corporate debt financing costs, full environmental disclosure of listed companies of their lower unit cost of debt capital; overall low level of environmental disclosure in the thermal power industry, but increasing trend. Theoretical study and institution-building, as well as enterprise autonomy make relevant recommendations.

Key words: Debt capital cost; Environmental information disclosure; Thermal power

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INTRODUCTION

Research the origins of environmental accounting in the Western 20 Century 40 Era of social responsibility, and to 1971 Mons written study of the transformation of the social costs of pollution control and 1973 Year Marin issued the accounting problems of pollution as a

milestone. Domestic 1992 year GE Jiashu, Professor in accounting study, published in the 1990's a new wave of accounting theory in the West—as the starting point of the green accounting theory, than abroad, domestic research started late. Become a research focus on environmental accounting.

Environmental protection is placed in front of sustainable economic development and deepens reform of socialist market economy as an important task. Environmental protection departments, stock exchanges, securities Department have promulgated a series of guidelines on environmental information disclosure of listed company papers, with a view to promoting environmental governance. How is the environmental information disclosure? Are bound by the enterprise's environmental behavior? The economic consequences of environmental information disclosure of how? Articles from the perspective of environmental information disclosure of debt capital cost impact through correlation analysis of empirical studies.

1. THE LITERATURE REVIEW

Cost of debt capital are important influencing factors of enterprise funding and management decisions, and business operators believe that voluntary information disclosures to help reduce the cost of capital (Graham et al., 2005). Verrecchia (2001), the studies found, information disclosure can increase investor awareness of enterprises, reduce the degree of asymmetry of information, improve the level of investor risk-sharing.

Information disclosure by investors predict the impact risk capital cost Barry Brown (1985), the earliest differences are significant by two sets of information content of stock portfolio analysis, studies predict how risk affects the cost of capital. Findings on information content of stock, investors predict return variance is smaller, require lower rates of remuneration, disclosure

of information affecting risk prediction in turn have an impact on return on equity. Lewellen and Shanken (2002), by constructing price model proves that predict risk in dividends of listed companies from the incompleteness of the information. Deviate they agreed that the real return on equity capital asset pricing model is due to the information asymmetry between investors and listed companies has led to parameter uncertainty.

Li (2010), set off from capital markets accounting conservatism study on the cost of debt capital, found that compared to the creditors and shareholders, are powerless. Timely and full information disclosure can ease the contradiction between the two, and provide timely risk signal, thus safeguarding the effectiveness of debt contracts, reduce the cost of debt capital.

Enterprises as members of society, should shoulder social responsibilities. Social responsibility information disclosure can be predicted by reducing investor risk, lower transaction costs, investors' preferences and other ways to influence the cost of capital for social responsibility (Richard & Welker, 1999). Dhaliwal, Zhen, Tsang, and Yang (2011) 1993-2007 year issued a separate social responsibility report of 213 United States companies for samples, research and voluntary disclosure of non-financial information for the company and relationship between the cost of equity. Study finds high cost of equity capital in the past tend to disclose the company's social responsibility report. Good CSR practices of companies to reduce the risk of investors expected, relative to the lack of social responsibility information disclosure of corporate, social responsibility information disclosure of companies lower cost of equity, with their greater size of equity capital, and showing a willingness to continue to expand the scale of equity capital. Study also found that social responsibility information disclosure and the company's cost of equity was significantly negative correlation.

In the legitimacy theory, considering that threatened the legitimacy of the enterprise are more likely to commit self-disclosure service to preserve its legitimacy (Adams, 2004; Gray et al., 1995). Changes in the disclosure of information would enable the public to understand their performance, decentralized public concerns about its legality, changing public expectations of their performance (Gray et al., 1995).

Proactive disclosure while reducing information asymmetry risk for investors expected, has also passed to investors its ability to cope with environmental risks, affecting the confidence of investors. The higher the quality of information disclosure and external investor confidence is stronger. Changes in investor confidence in investment behavior had an impact on enterprise value, such a positive effect on information disclosure quality enterprise-enhanced (Chen, 2013). Tang, and Li (2011) use behavioral finance and cognitive psychology, environment, information disclosure, and disclosure quality of listed

companies produce market in the capital market responses and economic consequences are analyzed. Study finds corporate environmental disclosure index associated with weak investor confidence, investors on environmental information disclosure of listed companies and the quality of response there is a certain lag, information disclosure of corporate environmental behavior and firm value: a weak positive correlation. Shen, and You, and Liu (2011) in 2006 and 2009 year of heavily polluting industry in China's listed companies to disclose data to address environmental information in their annual reports and relationship between the costs of equity. Securities system and green background that examines environmental impact on the relationship between the verification systems of refinancing. Study finds environmental information in the annual report a significant negative correlation between levels of disclosure and the cost of equity, refinancing environmental verification system can significantly impact the relationship between the two.

In summary, existing research focuses on non-debt capital cost perspective of environmental information, on the study on the information disclosure of lack of segmentation of the different nature of the information, as well as existing environmental disclosure on capital cost impact is mainly concentrated in the equity cost of capital. For this reason, this article from the environmental information disclosure of debt capital cost perspective, making correlation analysis based on empirical data in the thermal power industry.

2. STUDY DESIGN

2.1 Theoretical Analysis and Research Hypotheses

With the development of market economy, management and ownership separated the separation of ownership and improve efficiency in the market in the allocation of resources lead to principal-agent and eventually gave birth to the principal-agent theory. The theory is that agency based on asymmetric information, led to the bilateral imbalance in risk sharing. Principal-agent for creditors one of the contradictions and conflicts between shareholders and interests both of their essence is not consistent. Shareholders through corporate management development maximize the residual rights and security for creditors to pursue claims. Moral hazard and adverse selection are two major problems in the Agency, under the different interests of shareholders may take place by managers of moral hazard and adverse selection, violation of debt covenants, increase creditors bear the risk, but with fixed interest of creditor claims do not match. For its own protection, creditors require sufficient information to properly measured credit risk, or raise interest rates increase the risk return. Disclosure channels of communication established enterprises and creditors, creditor assess risk and determine the important support of loan conditions.

Market operating costs, even if voluntary transaction costs also exist. Important criteria for transaction costs have become a campaign. After Zhang Wu on the transaction cost theory of development, introduces the compact determinism. Enterprise contract theory mainly includes the contract number, the transaction costs of obtaining information, agent assessment costs and compensation costs. Debt covenants also face a number of similar transactions costs. Information disclosure about cost of creditors to obtain information, supervision and assessment of borrowing costs, maintenance costs of debt covenants and the creditor on the debtor's credit.

According to the theory of signal transmission, passing on information disclosure of corporate environmental risk, environmental management, environmental performance, environmental image, the ability to cope with risk and solvency, which become green important reference for decision-making by lenders under the credit system, affecting the confidence of creditors.

In the context of sustainable development, an important part of information disclosure in environmental disclosure. In summary, research hypothesis H1: environmental information disclosure and the cost of debt capital were significantly correlated.

Timely and full disclosure, weakening the degree of asymmetry of information between shareholders and creditors will help lower the predicted risk of creditors and the required premium, promote balanced risk sharing credit and debt, improve the ability of creditors to risk control, thus safeguarding the stability and effectiveness of debt covenants, and ultimately reduce the cost of debt capital. Proactive disclosures, by reducing transaction costs and help companies reduce cost of debt capital. Timely and adequate disclosure of information reduces the cost of creditors to collect information, improve the efficiency of a creditor on the debtor's business assessment, saves time and costs. Adequate disclosure of information reduces the borrowing cost of follow-up monitoring of creditors. With the help of debt reduction in maintenance of contracts signed and transactions costs, active information disclosure can increase debt credit help debtors seeking more affordable loan terms, such as a large line of credit, extension of loans with low interest rates, easing conditions.

In an increasing number of cases of environmental regulations, has a good environmental performance of enterprises, introduction of environmental regulatory obstacles to their current business development less than other companies, allows companies to meet the

new environmental regulation when switching costs low financial risk due to environmental activities and fewer environmental risks, so as to safeguard the security of creditor claims. Green loans rise, good environmental behavior of listed companies easier access to the social responsibility of banks and other financial institutions prefer to win loan approval. Compared with the poor performing enterprises environmental behavior, good environmental performance of listed companies in debt capital is less expensive. The resulting hypothesis H2: environmental disclosure level and the cost of debt capital is negative correlation.

2.2 Variable Selection and Model Set

Cost of debt capital are important factors for enterprise financing decision, the relationship between financial security and normal business operations? This article selects debt capital costs (CAP) as explanatory variables. Study in a foreign country, often using debt and debt measured as the average yield to maturity of debt capital cost, but because of the country's debt rating is not perfect, different classes of debt information is not sufficient. This article borrows Zou and Adams calculated: interest expense and capitalized interest on the sum / average interest-bearing liabilities at the end at the beginning, to measure the cost of debt capital.

In the context of rising green credit, corporate environmental behavior as important reference elements of the credit sector lending, corporate environmental disclosure standards in this paper (EDI) as explanatory variables. Common measurement of levels of environmental disclosure authoritative rating, number of annual information and content analysis. Constrained by shortcomings in the environmental rating in China as well as the amount of information scattered, the content analysis method used in this paper. Departments and related agencies in China issued a guidance document on environmental disclosure of corporate environmental responsibility, as well as the China study on the information disclosure system of project evaluation index system of environmental information disclosure as a reference on listed companies ' annual reports, CSR reports, sustainability reports, as well as environmental reports, environmental information is itemized in the scoring. Weights set in order to avoid subjective score environmental disclosure of listed companies and perfect than as levels of disclosure of environmental information (EDI). Specific rate basis have been shown in Table 1.

Table 1
Specific Rate Basic

Disclosure (out of 2)	Qualitative (1 min) Quantitative (1 min) Qualitative and quantitative (2 min)
Disclosure of carrier (out of 2)	Independent corporate social responsibility report or environmental reports (2 min) Annual report (report, important matters, reporting to the Board notes) (1 min)

To be continued

Continued

Levels of disclosure (out of 2)	Detailed (2 min) Summary (1 min) Not disclosed (0 min)
Environmental management (out of 3)	Environmental education and training (disclosure, 1 is not covered, 0 points) Environmental protection objectives (specifically, 2 part clear, 1; not specified, 0 points)
Environmental costs (out of 2)	Total water consumption (disclosure of 1, is not covered with 0 points) Standard coal consumption (disclosure of 1, is not covered with 0 points)
Environmental liabilities (out of 5)	Total waste emissions (disclosure of 1 minutes, did not put 0) SO ₂ emissions (disclosure of 1 minutes, did not put 0) CO ₂ and nitrogen oxides (disclosure of 1, are not covered with 0 points) Smoke and dust emissions (disclosure 1, is not covered with 0 points) Industrial solid waste (disclosure of 1, is not covered with 0 points)
Environmental inputs (out of 4)	Environmental investment (specific disclosures 2 minutes, simple disclosure of 1 minutes, not saying 0 min) Research expenses (currency 2 minutes, text 1 min did not have 0 points)
Environmental governance (out of 15)	Cleaner production implementation (data 2, type 1, and did not have 0 points) Wastewater discharge compliance (data 2 minutes, text 1 min did not have 0 points) Rate of comprehensive utilization of industrial solid wastes (data 2 minutes, text 1 min did not have 0 points) Comprehensive energy consumption declined (data 2 minutes, text 1 min did not have 0 points) SO ₂ , and CO ₂ , dust, nitrogen oxides emissions (more than two pollutants emission data 3, a contaminant reduction data 2, type 1, is not saying 0 min) Waste water emissions (data 2 minutes, text 1 min did not have 0 points) Water (data 2 minutes, text 1 min did not have 0 points)
Government Regulation (out of 2)	Environmental certifications and Awards (1 min, 0 points) Three simultaneous implementation system (1 min, 0 points)
Full marks	37 min

Note. Refer to the corporate environmental responsibility of the study on the information disclosure system of China project group.

Many factors affect the cost of debt capital. This article selects capital structure (STR) and long term solvency (LABI), short-term solvency (SABI) as a control variable. Capital structures measured by the ratio of debts to assets, higher the asset-liability ratio of enterprises, greater financial risk, creditors will demand higher-reward, and therefore higher the asset-liability ratio of listed companies, higher unit cost of debt capital. Multiple interest guarantee long-term solvency measure, short-term

solvency ratios measure with cash, short and stronger the solvency of the company, creditors can be guaranteed, in debt contracts, creditors will lower the premium, therefore stronger the solvency of debtor's business, and lower the unit cost of debt capital.

Based on the above analysis, the research hypothesis and variables selection, establish the following models:

$$CAP_{it} = C_i + A_i * EDI_{it} + B_i * STR_{it} + D_i * LABI_{it} + E_i * SABI_{it} + U_{it}$$

Table 2
Variable Definition and Predict Coefficient Sign

Variable types	Variable name	Variable symbol	Variable description	Predicting coefficient sign
Explanatory variables	Cost of debt capital	CAP	Capitalization of interest expense and interest/ Year end average interest-bearing liabilities	
Explanatory variables	Level of environmental information disclosure	EDI	Environmental information content ratio of scoring full marks	-
Control variables	Capital structure	STR	Expressed as a ratio of assets and liabilities	+
	Long-term solvency	LABI	Interest guarantee multiples used	-
	Short-term debt-paying ability	SABI	Cash ratio	-

2.3 Sample Selection and Data Sources

This article selects 2008 to 2012 related to thermal power plants in Shanghai and Shenzhen-listed power companies to study samples. Excluding special processing, incomplete information, and 2008 to 2012 only listed the company during the year, finally get 36 publicly traded companies. Through information collected 180 samples of data. Annual reports, CSR reports, sustainability reports, environmental reports from the giant tidal information network, interest guarantee multiples, ratios, debt to assets ratio of cash, assets, businesses from Taian database such

as average interest bearing liabilities. Then use Eviews 6.0 to process the data obtained corresponding results.

3. AN EMPIRICAL ANALYSIS

3.1 Descriptive Statistics Analysis

From the Table 3 as can be seen in fossil-fired power listed companies disclose environmental information levels vary considerably, and the maximum value reached 0.7838, The minimum value is 0. Judging from the mean, overall lower levels of environmental disclosure of listed

power company, 0.2784 enough 30%, levels of disclosure from the pass line still has a long distance. In respect of debt capital cost, samples of the company's biggest value is 0.1258, minimum of 0.0137, standard deviation of 0.0130 and mean 0.0621 is located in the median 0.0609 right, shows that thermal power classes listed debt capital cost differences are significant. Judging from the short and long-term solvency, the long-term solvency of listed power companies the difference was significantly greater than the differences in short-term debt-paying ability. In terms of capital structure and thermal power companies with an average asset-liability ratio of 0.6754 and overall capital structure more reasonable, however, some listed companies were ultra-leveraged, facing great financial risk, asset-liability ratio reached 0.9369.

Table 3
The Variable Descriptive Statistics

	CAP	EDI	STR	LABI	SABI
Mean value	0.0621	0.2784	0.6754	The 2.9589	0.2543
The median	0.0609	0.2432	0.7034	1.7532	0.1871
The maximum value	0.1258	0.7838	0.9369	The 44.0246	1.0699
Minimum value	0.0137	0.0000	0.2928	-13.1758	0.0073
The standard deviation	0.0130	0.2011	0.1472	The 5.8536	0.2387

Note. Giant Taian tidal information network and with data from the database.

Through to the listed company's annual report, environmental report, CSR report and analysis of environmental information in the sustainability report,

Table 5
Annual Thermal Power Plant Environmental Information Disclosure of Listed Companies in Terms of The Content of Change

Year	Environmental management	Environmental costs	Environmental liabilities	Environmental investments	Environmental governance	Government regulation	The maximum value
2008	0.03704	0.06944	0.15556	0.10417	0.12407	0.08333	0.15556
2009	0.10185	0.23611	0.12222	0.22917	0.19630	0.19444	0.23611
2010	0.35185	0.15278	0.18889	0.29167	0.27593	0.09722	0.35185
2011	0.50926	0.16667	0.13333	0.32639	0.28889	0.36111	0.50926
2012	0.51852	0.22222	0.18333	0.33333	0.31111	0.43056	0.51852

From the Table 5 see listed power companies in the area of environmental management, environmental investment and environmental governance disclosure levels increased, and environmental costs, environmental liability and disclosure by government regulatory render greater volatility, Shows that listed companies pay more attention to environmental management, environmental investment and environmental governance. Judging from the maximum change, 2008 year power industry listed company disclose performance best in environmental liabilities, 2009 year of thermal power industry in terms

combined with item-by-item scores are 2008 to 2012 listed power companies level of environmental disclosure is as follows:

Table 4
Levels of Thermal Power Industry Annual Environmental Disclosure of Listed Companies

Year	2008	2009	2010	2011	2012
Mean value	0.1246	0.2695	0.2748	0.3401	0.3829
The standard deviation	0.1268	0.1594	0.2126	0.2091	0.1918
The median	0.0676	0.2432	0.2703	0.3649	0.3784
Minimum value	0.0000	0.0000	0.0000	0.0270	0.0541
The maximum value	0.4865	0.7568	0.7297	0.7838	0.7838

Combining Tables 3 With the Table 4, While thermal power class listed company environment information disclosure level overall lower, but from annual are value changes trend see, thermal power class listed company of environment information disclosure level rendering yearly rose of trend, indicates that as economic of development, thermal power class listed company are gradually change with yiqian not reasonable of development way, attention environment management, active participation environmental protection, will environment strategy into company operating management strategy among.

Based on listed companies in environmental liability, environmental investment, environmental management, environmental management, environmental costs, government regulation and other plates to disclose details of scoring, then divide the plate out, get environmental information disclosure of listed companies in specific aspects of the change, as Table 5.

of environmental cost of disclosure of listed companies 'performance, best 2010 years to 2012 Best years in terms of environmental management to disclose performance further illustrates the trends in environmental management in enterprises.

3.2 The Testing Stationarity of a Variable Data

In order to avoid spurious regression occurs, the use of Eviews 6.0 Sample data for the variables ADF Test results indicate that the variable sample data smoothly, such as Table 6.

Table 6
The Variables ADF Testing

	Method	Statistic	Prob.
CAP	Levin, Lin & Chu t*	-15.4156	0.0000
EDI	Levin, Lin & Chu t*	-23.1848	0.0000
STR	Levin, Lin & Chu t*	-15.1334	0.0000
LABI	Levin, Lin & Chu t*	-36.6685	0.0000
SABI	Levin, Lin & Chu t*	-18.3738	0.0000

3.3 Positive Results and Analysis

Effects of explanatory variables the explanatory variables with fixed and random points, established on the basis of a random-effects model, HAUSMAN Test results indicate that 10% Below the significance level, rejected the original hypothesis. Therefore end up the same coefficient the fixed effects model to study the relationships between variables. An amendment to the above model in the form of:

$$CAP_{it}=C+A*EDI_{it}+B*STR_{it}+D*LABI_{it}+E*SABI_{it}+U_{it}$$

Table 7
HAUSMAN Testing

Test summary	Chi-Sq. statistic	Chi-Sq. d.f.	Prob.
Cross-section random	9.0773	4.0000	0.0592

Through the analysis of econometric software, environmental information disclosure of empirical results on the effects of debt capital cost as follows.

Table 8
The Empirical Results

Variable name	Coefficient	standard deviation	T value	P value
C	0.0502	0.0096	5.2480	0.0000
EDI	-0.0080	0.0044	-1.8058	0.0731
STR	0.0281	0.0138	2.0373	0.0435
LABI	-0.0005	0.0002	-3.3990	0.0009
SABI	-0.0132	0.0060	-2.1963	0.0297

*R*²=0.4286 *f*=2.6922 equation with *p*-value =0.0000

Seen from the empirical results, regression equations P 0 Generally notable. Level of environmental information disclosure, capital structure, as well as short-term long-term solvency symbols solvency of regression coefficients in line with expectations, and through 10% the significance level test. Validate the hypotheses H1, H1a, levels of environmental information disclosure of listed company's debt capital cost impact of significant and negative correlation between the two. In control of the capital structure, after the short and long-term solvency, levels of debt capital cost of environmental disclosure interpretation capacity close to 1%.

4. RESEARCH FINDINGS AND RECOMMENDATIONS

Through the 2008 to 2012 a nnual power of listed company: An empirical study found that in the control

of the enterprise's capital structure, as well as the long-term solvency after short-term solvency, environmental disclosure level and the cost of debt capital significantly negative correlation. Thermal power plant environmental disclosure of listed companies shows an upward trend, but the overall low level of.

In response to the current situation, and made the following recommendations: First, improve the creditor market construction, expand channels of creditors to obtain information, improve environmental information disclosure of listed company creditor discriminative ability for various environmental performance of enterprises with various debt covenants, listed companies from the point of view of debt capital cost constraints, environmental damage, encouraging listed companies in environmental protection. Second, improve environmental systems building, by a hard constraint system to promote enterprises in environmental protection. Strengthen law enforcement and penalties, reducing Enterprise illegal income, compressed space business opportunism. Change the way of examination of local governments, weakening the contradiction between economic development and environmental protection, reducing obstacles to effective law enforcement. Strengthening the Department of environmental protection, banking, law enforcement, combined with the legislative bodies, stock exchanges and other institutions. Increase the Government's eco-friendly financial incentives, and guide enterprises to environmental behavior. Third, environmental accounting research in China has started relatively late, and environment accounting study abroad is relatively mature and has rich experience in marketing operations. China should strengthen international exchanges, actively exploring appropriate to China's environment accounting theory and practice and experience. IV, the enterprise as a member of society, should be taking responsibility of environment protection responsibilities, build environmentally friendly corporate culture and environment-management strategy.

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